

inner border of the spiracle. A row of a few spines between the orbit and the lateral free border, nearer the latter; six or eight on the median line of the middle portion of the back; a double row parallel to the border of the pectoral fin, extending an inch within it, on its anterior half only; a series on the median line of the tail.

	M.
Total length.....	.307
“ width.....	.270
Length to mouth.....	.038
“ “ vent.....	.190
“ “ base of tail.....	.215
Expanse of ventral fins.....	.137
Interorbital width.....	.029

Upper surfaces lead colored with indistinct darker shades; middle of the anterior portion of the muzzle pale, with a dark spot behind it.

From the Bay of Pacasmayo, Peru.

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*On the Brain of Procamelus Occidentalis.*

By E. D. COPE.

(Read before the American Philosophical Society, May 4, 1877.)

I obtained a complete cast of the cranial chamber of the *Procamelus occidentalis*, which bears a fair proportion to the general dimensions of the skull. As compared with a llama of about the same size, the facial portion of the skull is longer, while the postorbital portion is as long, but narrower. This is indicated by the following measurements:

	Procamelus occidentalis.	Auchenia lama.
Length of skull anterior to orbit .....	.180	.153
“ “ posterior “ .....	.110	.105
Width “ at anterior border of orbit....	.080	.090
“ “ middle of zygomatic fossa..	.062	.065

The olfactory lobes of the brain have nearly the same position in the two species, extending anteriorly to opposite the middle of the orbits.

The brain exhibits large cerebellum and hemispheres, and rather small olfactory lobes. The cerebellum is entirely uncovered by the hemispheres but is in contact with them. The lateral lobes and vermis are well developed. The hemispheres are well convoluted, the longitudinal posterior convolutions giving way anteriorly to lobulate ones. The sylvian fissure is well marked. The sides of the medulla oblongata are compressed and vertical at the pons, in correspondence with the vertical position of the petrous bones. The origins of the ophthalmic and maxillary branches of the trigeminus nerve are not divided by a septum, while that of the man-

dibular branch is quite distinct from the others. The optic nerves are large. The olfactory lobes are separated by a deep fissure below the extremity of the hemispheres; they project freely beyond the latter, being separated by a deep fissure. Their free portions are short, truncate and compressed. The anterior pyramids are not preserved on the inferior face of the cast of the medulla oblongata. The hippocampal lobes are subround and protuberant.

From the detailed description following, it may be derived, that while the arrangement of the convolutions of the anterior lobes of the hemispheres is more simple than in any recent Ruminant, that of the middle and posterior lobes is essentially similar to that characteristic of the latter order of *Mammalia*.\*

The brain displays the characters of the older types of *Ruminantia*, although not materially smaller than that of the llama, an animal which it equaled in general proportions. The hemispheres are, however, not produced so far posteriorly in the *Procamelus* as in the *Auchenia*, reaching only to the line of the *meatus auditorius externus* in the former.

The vermis of the cerebellum rises abruptly from the medulla, having a nearly vertical direction to a point a little lower than the superior plane of the hemispheres. The lateral lobes extend on each side of it, each one having a rather greater width than the vermis. Their posterior faces are sub-vertical, and are directed slightly forwards. Each projects laterally into an apex at the middle of its elevation, and then contracts downwards into the angular line which marks the posterior border of the petrous bone. From a point between each apex and the vermis a ridge rises obliquely inwards to the superior plane of the cerebellum, where each one enlarges and joins the median transverse line. The angle above described as descending from the lateral apex of the cerebellum curves forwards, forming a lateral angular border of the pons varolii on each side. The flat space enclosed between this line and the posterior border of the hemisphere is interrupted by two prominent tuberosities. The superior is small, sub-oval, and is near to the posterior border of the hemisphere. The other is a short prominent ridge directed downwards and forwards, just behind the lobus hippocampi. Its inferior end corresponds with the origin of the mandibular branch of the trigeminus, and perhaps the facial nerve.

The medulla oblongata is contracted at the foramen magnum, and has a sub-round section slightly flattened below. Its inferior face is then rounded, then flattened, and then concave between the anterior part of the lateral ridges. The bases of the maxillary branches of the trigeminus nerves are stout, and directly in line with the origins of the mandibulars. Between them the base of the brain is concave, and the optic nerves issue but a little distance in front of them. The lobi hippocampi are sub-round and rather prominent; they are terminated in front at the foramen sphenorbitale by the contraction of the cranial walls. Their surface displays

\* See Paul Gervais' *Journal de Zoologie*, I, 1872, p. 159.

slightly defined convolutions, the best marked being inferior and sub-round in form.

The cerebral hemispheres, viewed from above, have an oval outline, and are rather narrower anteriorly than posteriorly. They contract posteriorly from the sylvian convolution. The profile descends gradually to the olfactory lobes. The superior surface is little convex in the transverse direction. The fissure of Sylvius is nearly vertical in position, and its superior extremity is visible from above. A strongly marked fissure extends posteriorly from it, defining the lobus hippocampi above. The sylvian convolution the thickest of all, and its outer border is emarginate in front and behind; below the postero-superior emargination it is thickest and most protuberant. Between it and the position of the falx there are three longitudinal convolutions, the external, the median, and the internal. These are slightly divergent posteriorly, but the posterior extremities of those of one side tend to unite on the posterior border of the hemisphere. Their surfaces are smooth. The external is widest medially: and it terminates anteriorly just behind the apex of the sylvian convolution. The internal is double posteriorly; the median is simple, and unites with the internal above the apex of the sylvian convolution. The two conjoined continue for a short distance and terminate in a broad tuberosity. Below the external convolution on the side of the posterior part of the hemisphere there are four small longitudinal convolutions. The orbital portion of the hemispheres is extensive, and nearly smooth from the olfactory lobes to the supra-orbital border. This is not prominent, but is represented by a short longitudinal ridge. Above each of these, on the superior or front aspect of the hemispheres, is a massive convolution bent crescent-shaped, with the convexity inwards. The posterior part of the convolution is a sub-round tuberosity which stands opposite to, and in front of, the furrow separating the sylvian and median convolutions. The middle part of the crescent is less prominent, but the anterior extremity forms another tuberosity whose long axis is directed downwards and outwards. The crescentic convolution of the one side is separated from that of the other by a wide, shallow, median longitudinal groove, which extends transversely at the posterior tuberosities. The two tuberosities and the olfactory lobes form three descending steps.

As compared with the brains of the existing *Bovidae* that of the *Procamelus* differs in the forms of the cerebellum and medulla oblongata as already pointed out. The hemispheres differ in being shorter behind and more depressed in front. The convolutions of the posterior region are the same in number as in the sheep, but are less undulating in their outlines; but there is a marked difference in the anterior convolutions. The median convolutions do not, as in the sheep, extend to the extremity of the anterior lobe, but terminate above the sylvian fissure, so that there only remain in front of them the two large supraorbital convolutions, instead of the four common to existing *Bovidae* and *Cervidae*.\* In this respect it more nearly

\* See Leuret et Gratiolet *Anatomie comparée du Systeme Nerveux*, 1839-57, Atlas, pls. vii-x.

resembles *Oreodon*, but in this genus the internal convolution is continuous with the supraorbital.\*

EXPLANATION OF PLATE.

Brain of *Procamelus occidentalis* from a cast, two-thirds the natural size.

Fig. 1. View of the left side.

Fig. 2. View of the superior surface.

Fig. 3. View of the inferior surface.

*On the Vertebrata of the Bone Bed in Eastern Illinois.*

BY E. D. COPE.

*Read before the American Philosophical Society, May 20, 1877.*

It is already well known that a few years ago, Dr. J. C. Winslow discovered in the Eastern part of the State of Illinois, a bone bed containing the fragmentary remains of reptiles and fishes. From some of this material placed in my hands, I identified four species of Vertebrata, two Rhynchocephalian reptiles, one a Dipnoan and one Selachian fish†. These were named, *Cricotus heteroclitus*, *Clepsydrops collettii*, *Ceratodus vinslovii*, and *Diplodus* sp. indet. It was stated in connection with the descriptions of these, that they indicate Triassic or Permian age for the bed in which they were found, since on the one hand *Reptilia* have not been found in the coal measures, nor on the other hand has the genus *Diplodus* been found above the Carboniferous series of rocks.

Doctor Winslow, in response to my inquiries, has sent for my examination another series of these fossils, which contains several species not previously known from the formation. Subsequently William Gurley discovered another exposure of the bone bed, and obtained a number of useful specimens, including some of species not previously known, which he also kindly placed at my disposal. To both these gentlemen I desire to express my sense of the obligation under which they have laid me. Descriptions of some of the species are now given; a complete account of the fauna is reserved for an illustrated memoir now in preparation.

STRIGILINA LINGUEFORMIS Cope, gen. et sp. nov. Petalodontidarum.

Char. Gen. The tooth is a flat osseous plate whose outline is pyriform, the wider end recurved in one direction as the transverse cutting edge; the other extremity narrowed and recurved in the opposite direction as the root. The side from which the cutting edge arises is crossed by numerous plicæ from the base of the root to near the base of the cutting edge; the opposite side is smooth.

The genus appears to resemble most nearly the *Climaxodus* of McCoy.

\* Leidy, Extinct Fauna, Dak. and Nebraska, pl. xiv, fig. 11.

† Proceedings Academy Philadelphia, 1876, p. 404.